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A smart night's sleep

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Although a new wave of products has launched to help us get more rest, Wency Leung reports that they're actually just putting high-tech spins on 17th-century ideas

Julian Jagtenberg cuddles a robot to sleep at night. The lanky, bespectacled 23-year-old isn't shy about admitting this either. He proudly wears a T-shirt that states in bold, capital letters: "I GO TO BED WITH A ROBOT."

As a robotics engineer and co-creator of Somnox, which has been billed as "the world's first sleep robot," Jagtenberg believes he's at the forefront of a sleep revolution. His creation, a hefty bean-shaped cushion that rhythmically expands and contracts to mimic breathing, is designed to feel like a living creature. By simulating the calming effects of snuggling a pet or spooning a loved one, it's meant to soothe users to sleep.

From the Somnox headquarters in Delft, the Netherlands, he imagines a future in which new generations of ever more lifelike automatons will respond to our movements and preferences to comfort us into slumber. "If it's up to us, in a couple of years, everyone will have a sleep robot in their bed," he says. "It will be just as logical as having a pillow or a mattress."

The sleep revolution Jagtenberg envisions is not limited to electronic bed companions. He imagines his robots will one day be linked to an entire network of devices around our homes that will respond to, and even anticipate, our sleep needs. Our lights will know when to automatically dim or brighten, for example, mirroring the natural light of the sun.

Our blinds will draw and lift on their own. Our thermostats will learn to lower at night to keep us comfortably. And strategically placed scent diffusers will recognize when to provide a whiff of lavender to calm us down before bed.

All of this is meant to combat awful sleeping patterns that have become the norm around the world.

In Canada, about a third of adults get less than the recommended seven to nine hours, and roughly half report having trouble falling or staying asleep.

Much of the technology Jagtenberg imagines is already available in some form. And with machine learning on the horizon, many sleep aids are expected to become increasingly responsive and customized to help us get the shut-eye we need. Early adopters of sleep technology and sleep-centred architecture and interior design can be found in the hotel industry, whose business depends on providing customers a good night's sleep. AccorHotels' new "Smart Room" concept, for example, features curtains, lights and music that can be adjusted using a tablet, as well as sleep aids such as the Dreem headband that uses sound stimulation to influence brain waves during sleep, according to the industry magazine Hotel Management.

Many of these changes are also making their way into homes, as the consumer demand for better sleep environments has companies such as IKEA taking note. At the Swedish furniture maker's Democratic Design

Days event last year, innovation and creative manager Yasushi Kusume said the company has been mulling how to create holistic sleep solutions. Beyond focusing on beds, he said, IKEA is considering how to promote sleep with products such as fragrance and plants to improve air quality, and shower heads that provide a misting, rather than invigorating, prebedtime cleanse.

The hope is that such innovations will create the optimal environment – that is, one that resembles what it was in the past, before our nights were disrupted by artificial lights, central heating, digital distractions and the stresses of modern life. A sleep revolution, in other words, means fighting against the sleep-sapping effects of how we live today.

D r. Sasha Handley finds the way children sleep “quite frightening.” Or rather, what she finds alarming is they don't sleep nearly enough.

Handley is a senior lecturer in early modern history at the University of Manchester, the author of *Sleep in Early Modern England* and a self-described good sleeper. (“It's my favourite activity, pretty much,” she says.) While providing lessons on sleep history to British school children, Handley has encountered students as young as 9 who tell her they stay up til 1 a.m. playing computer games and get around five hours of sleep a night – far short of the nine to 11 hours recommended for their age.

“[They] have no sense of why you would put the Game Boy down and go to sleep instead. They see no value in it,” she says.

Their approach to sleep portends a bleak future.

Inadequate sleep can hamper their performance in school, thus hurting their chances of success in the future, Handley says. It is also linked to a range of health problems, including obesity, depression, cardiovascular disease and dementia.

With adults not faring much better, many are turning to special mattresses, apps and white-noise machines to combat their sleep troubles. In fact, the growing global market for sleep aids, in the form of drugs and devices, is, by some accounts, expected to be worth nearly US\$80-billion by 2022. And yet, in spite of their high-tech wizardry, many of the proposed fixes behind these devices aren't radically different from those of the preindustrial era Handley studies. In fact, the notion that sleep is critical for our long-term health – an idea supported today by a growing body of research in neuroscience and physiology – was something early modern British people incorporated in their daily lives.

The inhabitants of England circa the 1600s recognized that a good night's sleep required getting outside in fresh, wholesome air during the day, adhering to consistent sleep and wake times and adopting a healthful diet – one that was largely sugar-free and caffeine-free, Handley explains. (A healthful diet also meant avoiding eating late at night, eating moderately and limiting their intake of meat and alcohol to prevent nighttime indigestion.) They also took pains to create peaceful sleep environments and wound down each night with calming activities, such as reading or embroidering by candle light.

Whereas today we have aromatherapy gadgets, such as the AromaCare essential oil diffuser, the early modern English scented their bedding with sweet rosewater or stuffed dried rose petals in their pillows and mattresses. Instead of “performance” bedding, such as the Sheex brand of bed sheets and sleepwear inspired by moisture-wicking athleticwear fabrics, they often used linen, which was light, cool and breathable. And instead of sleep robots and apps to guide breathing and meditation exercises, they practised prebed rituals, including prayer and confessing the sins of the day.

It would be wrong to assume sleep disorders, such as insomnia or sleepwalking, did not exist back then. Such problems have long plagued individuals who are genetically predisposed to them, Handley says. But the kind of sleep deprivation caused by lifestyle factors, such as stress or distracting stimuli, was far from the widespread problem it is today.

Indicative of the importance the early modern English placed on sleep, beds and bed textiles accounted for about one-third of the value of an entire household's contents, she says. Sleep was part of a culture of preventive health care that arose, in part, because physicians were expensive and difficult to access. Sleep also belonged to a set of religious behaviours, she explains; the way people slept and the hours they slept were closely tied to their reputation and identity. (As Handley puts it, “It's a sign that you are a faithful and good Christian if you're going to bed and getting up at the right times rather than going to the inn and getting drunk and staying there all night.”) In this regard, there may be some signs that sleep is making a comeback as a part of people's reputations, at least in certain segments of society. The likes of Arianna Huffington, Warren Buffett, Bill Gates and Jeff Bezos, for

instance, are famous champions of sleep. "I like to sleep. So I will usually sleep eight hours a night, and ... I have no desire to get to work at 4 o'clock in the morning," Buffett said in an interview with PBS NewsHour.

NFL quarterback Tom Brady, meanwhile, has lent his stardom to Beautyrest mattresses and Under Armour's "Athlete Recovery Sleepwear," pyjamas that are designed to maintain a comfortable body temperature.

"Sleep is the new status symbol," **Marian Salzman**, a renowned trend-spotter and chief executive of the public-relations agency Havas PR North America, told NBC Chicago last year, noting people are more likely to boast about how much they spent on their mattress than on their clothes.

Yet the new wave of products and gadgets designed to improve our sleep leaves Handley feeling conflicted.

"It's a tricky one, isn't it, because I'm totally on board with the mission to improve people's sleep.

But I also think it sits a bit uncomfortably with me," she says, explaining those offering sleep solutions "are not telling people anything new really. And they're recycling familiar knowledge that we didn't used to have to pay for."

If Britons from the 17th century recognized the value of sleep, it's worth examining where our attitudes and habits around sleep started to go awry.

Handley points to a "sleep crisis" arising in early 18th-century London, at a time when the city experienced rapid urbanization, the widespread introduction of street lights and much improved transportation links. This meant people could easily get to new social venues, such as opera houses and pleasure gardens, which were deliberately set up for activities in the evenings. Perhaps unsurprisingly, these changes coincided with an explosion of criticisms and complaints about the "unnatural" sleep schedules of high-living city-dwellers, Handley says.

The introduction of electric light, in particular, is one of the key factors that have dramatically changed how much and how well we sleep. (Other factors include regularized temperature, caffeine, alcohol and "a legacy of punching time cards," according to Dr. Matthew Walker, author of *Why We Sleep: Unlocking the Power of Sleep and Dreams*.)

At the University of Colorado, Boulder, sleep researcher Dr. Kenneth Wright zeroes in on the effects of our modern exposure to light. Wright, a professor of integrative physiology, has been wrestling with the question of how our modern environment affects our circadian clock and sleep for more than a decade. The way he sees it, there are two things that are primarily different between our modern environment and the natural environment; first, the intensity of light we naturally get when we're outside is four to 10 times greater than what we get when we're indoors. Second, our modern ability to flip on a light switch in the evenings extends the amount of light we get long after the sun sets. This means compared with our ancestors, we get a lot less light during the day, but for a much longer period, all of which does a number on our circadian clock.

As Wright explains, our circadian clock is the "master clock" in our brains that tells us when to wake, when to sleep, when to eat, when we're at our peak performance. The hormone melatonin is a marker of this master clock. Melatonin rises a couple hours before we go to bed and dips when we're awake.

To test what would happen if we returned to our natural environment, Wright has conducted a series of studies measuring the melatonin in participants' saliva before and after they spend several days camping in the summer and winter. Regardless of the season, Wright found participants' melatonin levels rose at least a couple hours earlier after the camping trips. He suggests this means our circadian clocks are set earlier in the natural environment.

Put another way, he says: "We could say our clocks are timed later in modern society. So that contributes to us staying up later, it contributes to us not wanting to be there in the morning for that first class or for that first meeting ... because our clocks are telling us we should still be asleep."

Because our circadian clocks are particularly sensitive to blue and green light, Wright says computer apps and devices designed to reduce these colour frequencies on our computer screens and smartphones should theoretically help lessen their impact on our internal clocks. But he says, the efficacy of these technologies have yet to be proven.

Wright sees promise in so-called tunable LED lighting, which allows the user to adjust the intensity and spectrum of light. This technology may provide us with indoor lighting similar to sunlight during the day, helping us stay awake and alert, and dial down in the evenings to prepare us for bed. Examples of this include Visa Lighting's Symmetry lighting, which can be used in offices, schools and hospitals, Philips's tunable white solutions and Pure

Lighting's Tunable White technology. (Even so, Wright recommends starting the day with a simple walk outside in the sunlight.)

But when it comes to other sleep technologies such as aromatherapy or meditation devices, Wright suggests they may be helpful when they're used as part of a relaxing bedtime routine, but there is no one-size-fits-all solution.

"Whatever works for you to kind of reduce that stress, reduce that arousal, that's great," he says. "If those things work for you, do it."

In an e-mail from his headquarters in Sweden, Carl Johan Hederoth, chief executive of Northcube – the creators of the sleep-tracking app Sleep Cycle – set out his vision for the future.

"We want to see sleep technology as a natural part of people's lives, something that does not disrupt or stress, but simply fits in seamlessly," Hederoth wrote.

Herein lies the paradox of sleep technology. New products and gadgets strive to make it easier for us to get quality sleep in spite of our modern lifestyle, yet many experts, Hederoth included, agree that our sleep will only improve if we actually change our routines and attitudes toward it.

"A lot of time, I think [sleep] technology just gets focused on the pebbles," says Dr. Amy Bender, sleep scientist at the Centre for Sleep and Human Performance in Calgary. Too often, she says, people become fixated on the innovative qualities of a new mattress or sleep device, and lose sight of prioritizing sleep itself.

Bender, who has developed sleep intervention protocols for Canadian athletes, including competitors at the Winter Games in Pyeongchang, says she thinks sleep technologies can be beneficial if they actually help change behaviours or the sleep environment. For instance, she believes blue lightblocking technologies, such as f.lux software, may improve our sleep quality. But Bender says other, decidedly low-tech measures, such as trying to go to bed earlier or taking naps, would likely help us achieve better sleep more simply.

Meanwhile, in bustling Paris, designer Pierre-Luc Deniel used to lie awake in bed for two to three hours, his thoughts churning, before finally slipping into slumber. As a light sleeper who's sensitive to the noisy urban environment, he'd find himself waking up again at least one or two times during the night.

His friend Alex Dujoncquoy had even more trouble, relying on sleeping pills before eventually turning to meditation, which he found effective in helping him sleep. Inspired by their personal nighttime struggles, Deniel and Dujoncquoy teamed up five years ago to create Dodow, a bedside device that leads users through a meditative breathing technique.

The device projects a rhythmically expanding and contracting light halo onto the ceiling. By breathing in time with the light, around 75 per cent of users report improvements in their ability to fall asleep, Deniel says. They fall asleep an average 2.5 times faster with Dodow than without. He adds users need not change anything about their sleep routines. "Our product is for people who don't want to change."

The 31-year-old designer says Dodow works for him. With the device, he can fall asleep within about 25 minutes. The irony is, thanks to the growing popularity of his product, he finds he now has less time for rest. He often goes to bed at midnight or 1 a.m., and finds it difficult to avoid bringing his laptop into bed.

"Now, we have a lot of Dodows to send," he says.

"We have a lot of work."

Additional reporting by Maryam Siddiqi

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